

## SOUTHERN GREAT PLAINS SITE MEETS SCIENTIFIC NEEDS

The ARM Climate Research Facility (ACRF) is unique in its dedication to long-term, continuous measurement of cloud and radiation properties that are critical for climate modeling. Delivering the highest-quality data products in such a monumental undertaking requires diligent maintenance and rapid repair of instruments, plus an integrated instrument calibration process.

During 15 years of operations, the full-time, well-trained, experienced staff members at the ACRF Southern Great Plains (SGP) site have developed on-site repair and calibration capabilities that have increased efficiency and reduced costs. Extension of these resources to ACRF as a whole has positioned SGP facilities and personnel to help address most ACRF needs that develop.

The SGP site can provide extensive support for both ARM scientists and vendors who wish to deploy instruments for field campaigns, evaluation, or testing. The staff members are an invaluable resource in turning a developmental instrument into a field-hardened design capable of unattended, continuous operation. In addition, the SGP site has a full-time safety officer and several people trained in laser safety and inspection of electrical equipment.

The SGP Central Facility (CF) is an ideal location for testing and validating the performance of new and repaired instrumentation. The CF also offers an opportunity for testing of operational, maintenance, and calibration procedures and data ingestion software, because nearly every instrument used by ACRF is represented at the CF. The Guest Instrument Facility (GIF) and four easily configurable instrument deployment platforms in various locations around the CF can host instrument deployments of nearly any size, up to seaworthy shipping containers.

## Electronics Repair Laboratory

The Electronics Repair Laboratory (ERL) was established at the SGP in 1998 to reduce costs by repairing instruments on-site. (See the May 2006 issue of this newsletter for details.) Reducing the number of repairs made by manufacturers and eliminating shipping costs have decreased ACRF operating costs and shortened instrument downtime — by as much as several months for instruments that otherwise would be shipped overseas for repairs. The overall reduction in instrument repair time has a direct impact on data availability totals, which are a primary ACRF performance metric.

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The ERL provides a wide range of diagnostic and repair services. Instrument components routinely replaced in the ERL include power supplies, shadowband motors, wind sensor bearings, cable and connectors, universal power supply (UPS) batteries, and electronic boards. On-site repair is available for data loggers; electronic boards; operating systems; storage modules; modems; air pumps; motors; various instrument components; and wind, humidity, and temperature sensors. Instrument calibrations and computer repairs are also carried out. When the ERL cannot make a repair in-house, the ERL staff can often evaluate the equipment and work with the vendor to identify the most likely cause of failure. This capability decreases off-site repair time.

To date, most ERL repairs have been on SGP instruments, but the facility's capabilities are being extended to other ACRF sites. The experienced ERL staff act as consultants to determine whether the instrument or component should be shipped directly to the vendor for repair or to the ERL for further evaluation and/or repair. Since its inception, the ERL has saved the ARM program approximately \$150,000.

## Calibration Facilities

**Radiometer Calibration Facility.** The SGP has long been the primary focal point for radiometer calibrations for all ACRF sites. The SGP Radiometer Calibration Facility (RCF) — specifically designed and built for its special purpose — hosts various program-wide calibration activities, including the well-established Broadband Outdoor Radiometer Calibrations (BORCAL) and the Infrared Radiometer Calibration (IRCAL) programs. Annual BORCAL and IRCAL events for more than 300 radiometers keep all of the ACRF visible and infrared radiometers calibrated and referenced to the world standard in Davos, Switzerland.

**Temperature and Humidity Probe Calibration.** All SGP instrument technicians carry hand-held temperature and humidity probes that serve as “standards” for calibrating field sensors. The standard probes are checked for accuracy weekly in a calibration chamber designed to produce accurate humidity and temperature values through use of principles developed by the National Institute of Standards and Technology. If the field sensors deviate more than an acceptable amount in comparison to the standard probes, they are exchanged and brought to the CF to be recalibrated in the calibration chamber. Each year the SGP calibrates more than 150 temperature and humidity probes.

**Rain Gauge Calibration.** Relatively new to the SGP is the Dynamic Rain Gauge Calibration System. A basic rain gauge calibration involves dripping a known amount of water into the gauge and recording the amount of water measured by the gauge. This procedure, however, does not take into account errors that might be introduced during a heavy rainfall event — a common occurrence during spring and summer in Oklahoma. A dynamic rain gauge calibration compares known rainfall rates generated by computer-controlled equipment with rates measured by the gauge being calibrated. Documented differences can be accounted for during data processing. On average, more than 100 rain gauge calibrations take place at the SGP CF each year.

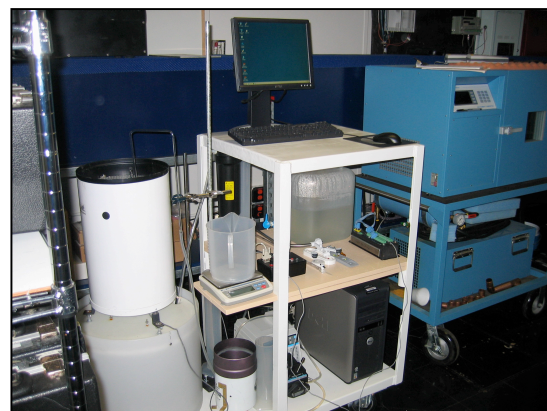


Figure 1. The Dynamic Rain Gauge Calibration System (ARM photo).

**MFRSR Calibration Capabilities.** The SGP recently acquired from Pacific Northwest National Laboratory equipment needed to calibrate Multi-Filter Rotating Shadowband Radiometers (MFRSRs) and similar radiometric sensors. Calibrating and characterizing these instruments requires significant effort. The formal calibration procedures and staff training have been completed. With more experience in using this equipment, the SGP will gain a significant new calibration capability.

## **Shipping and Receiving Facility**

The SGP is the central shipping, receiving, and storage depot for the ACRF. With the completion of the new Shipping and Receiving Facility in 2006 (February–March 2006 issue of this newsletter), the SGP can handle and store large shipments with greater ease. The new facility, which has 2,000 square feet of floor space and an additional 2,000 square feet of shelf space, houses items that do not require climate control in storage, such as instruments, bulky shipping cases, and other expendables. The depot stores parts for other ACRF sites, serves as an intermediate staging area for deployments of the ARM Mobile Facility, and is the overall coordination point for repair and general facility shipments. The SGP handles some 1,500 shipments each year.



Figure 2. The Shipping and Receiving Facility (ARM photo).